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CTIONS FOR COLLECTING INFORMATION AND SPECIMENS FOR PHYSICAL ANTHROPOLOGY.

BY

ALEŠ HRDLIČKA,
Assistant Curator, Division of Physical Anthropology.

Part R of Bulletin of the United States National Museum, No. 39.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1904.

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NOTE.

The Smithsonian Institution, whose first scientific memoir re to the subject of anthropology, being the work of Squier and] on Ancient Monuments of the Mississippi Valley, through the e of field workers and friends, early undertook to collect material anatomical anthropology. In the earlier years, with the grow the Army Medical Museum, it was deemed fitting that these c tions should be deposited there. More recently they, and with all the accumulated normal osteological material of the Army Me Museum, were transferred to the U. S. National Museum. In vi this and the growing importance and educational possibilities o science of man, a Division of Physical Anthropology was establ in the National Museum and placed in charge of Dr. Aleš Hrdl who is organizing and arranging the material thus far acquirec has already secured considerable accessions. The present instruct prepared by him, are designed to increase these collections and fi the many gaps still existing, with a view of facilitating and adva the study of the human race, and more especially of those divisio it inhabiting the United States.

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1904

TABLE OF CONTENTS.

Page.
ntroduction 5
ollections of physical anthropology 8
  Crania and skeletons 8
    Sources of, among civilized peoples 9
    Sources of, among primitive peoples 10
    Of ancient peoples and early man 11
    Directions to collectors 12
  Brains 14
    Directions to collectors 15
  Embryological material 17
    Suggestions to collectors 17
  Photographs and casts 18
  Additional objects to be collected 22
he collectors 22
bservations 23
olor standards 25

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DIRECTIONS FOR COLLECTING INFORMATION AND SPECIMENS FOR PHYSICAL ANTHROPOLOGY.

By Aleš Hrdlička,
Assistant Curator, Division of Physical Anthropology.

These instructions, with introductory notes, are addressed to regular l special collectors, and also to those who by their opportunities for vel may help the science of physical anthropology.

The notes have been restricted to what is of most importance. ould further information be desired, it will be cheerfully furnished.

INTRODUCTION.

Physical, i. e., anatomical, anthropology is one of the main branches the extensive science of mankind. It is that part of anthropology which are studied variations in the human body and all its parts, l particularly the differences of such variations in the races, tribes, nilies, and other well-defined groups of humanity. Physical hropology accumulates facts concerning these variations in every t of the earth, and seeks their causes and significance. On the is of such knowledge and with the help of other sciences it endeavors trace man's evolution, to show his biological history, as well as the cesses of differentiation actually going on in him, and to outline tendencies of his physical life for the future.

Physical anthropology was specialized from general anatomy mostly ring the second half of the nineteenth century; its beginnings, how- er, date much earlier. Its pioneers and promoters included all the eat naturalists and anatomists, as Blumenbach, Buffon, Camper, Dau- nton, Hunter, Retzius; with its later workers were Allen, Broca, sk, Milne-Edwards, Flower, Morton, Quatrefages, Virchow, elcker; while among the many living men of science who ve rendered prominent services to or are now active in physical hropology are Anutshin, Beddoe, Boas, Dwight, Haddon, Hamy, llman, Lombroso, Manouvrier, Martin, Matiegka, Myers, Pfitzner, rson, Ranke, Retzius, Schmidt, Schwalbe, Sergi, Tarenetzki, Topin- l, Turner, Waldeyer, etc. It is evident that physical anthropology serves, has received, and is now receiving widespread scientific ention of the highest order.

The work carried on by physical anthropologists consists of inve
gating and teaching. For both these, a part of the work has to
done on living and a part on dead representatives of races, tribes
other groups of mankind.

The living are examined, measured, photographed, and cast, eit
in laboratories or in the field; but dead bodies or any parts of tl
can be studied or prepared for study, demonstration, or exhibiti
only in laboratories specially fitted for the purpose. They must
gathered from hospitals, morgues, and dissecting rooms; clean
catalogued, and numbered; and then properly stored for preservati
reference, or further investigation. It is plain that such mate
can be utilized profitably only in large institutions which can furn
and maintain laboratories, give proper care to the material, and h
space for exhibition and storage.

The number of even the more important races, tribes, and ot
groups of mankind is large, and for proper research, instruction,
exhibition, each group must be represented by many individuals.
better any group is represented in numbers the more valuable will
the results in every direction. It is for these reasons that great
lections in physical anthropology are needed and sought by such in
tutions as the United States National Museum and other establishme
where this branch of science is pursued.

The necessity for large and comprehensive assemblage of pro
material for physical anthropology has been recognized since
times of Blumenbach (1753–1840), with the result that to-day ev
important museum or institution of natural history or anatomy ha
racial collection of skulls, bones, etc. There are a number of such
Europe, headed by that of the School of Anthropology in Paris;
there are several in the United States, principally that in the Uni
States National Museum (a larger part of which was, up to 1898,
served in the Army Medical Museum); and those in the Academy
Natural Sciences, Philadelphia; in the Peabody Museum, Cambrid
Massachusetts, and in the American Museum of Natural Histo
New York City. The number of specimens in each one of these
lections reaches into the thousands, and yet not only individually,
even collectively, they are far from properly representing even
more important actual groups of mankind; while the representati
of the man of the past are few indeed. Leaving other than Ameri
collections out of consideration, these are as a whole fairly rich
North American and Peruvian skulls; poor in whole skeletons; ve
poor in material from Alaska, the Antilles, Central and South Ameri
as well as from all parts of the world outside of America; and alm
absolutely wanting in such parts of the body as the brain, or otl
soft organs and in racial fetal material.

All parts of the body, from all stages of life, are fit subjects for physical anthropology, because racial, tribal, or other group differences are found in all of them. Thus far, however, but little attention has been paid in the United States to anything besides the racial, particularly Indian, skeletal constituents, and especially the skull, objects which are of more general interest, more abundant, and comparatively easy of collection and transportation. But even with the skulls and skeletons no systematic collection on a large scale, or a collection comprehending all the important elements of the population, has ever been attempted. All of this explains the condition of our collections and should indicate the way to their improvement.

There are two lines along which it will be necessary to proceed in order to improve the efficiency of American collections in physical anthropology, namely:

(1) The introduction of systematic, comprehensive gathering and exchanges; and

(2) A general bettering of the method of collecting.

Systematic gathering and exchanges are functions of the men in charge of the collections, and can be brought to a proper degree of efficiency by an association and collaboration of these. A general bettering of the method of collection requires, in the first place, a good, handy, and generally available manual of advice and instruction to those collectors who can not be reached and taught personally.

A number of "Instructions" for travelers and anthropologists are in existence,[a] but there is none, especially in the English language, strictly or sufficiently devoted to collectors for physical anthropology. The majority of these "Instructions" are mainly systems of questions in ethnology, while others approach more the character of text-books on anthropometry. There is need for a guide to show all that physical anthropology needs, where and how the specimens can be secured, how they are to be taken care of before they are received by the Museum, and also what collateral observations are of importance in connection with the specimens.

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[a] Broca, Pierre-Paul, Instructions craniologiques et craniométriques de la Société d'anthropologie de Paris. Mém. Soc. d'anthrop. de Paris, 2d series, II; also 1 vol. in 8vo, Paris, 1875.—Broca, Pierre-Paul, Instructions générales pour les recherches anthropologiques à faire sur le vivant, 2d éd., 1 vol. in 8vo, Paris, 1879.—Instructions for Research Relative to the Ethnology and Philology of America, by George Gibbs, Smithsonian Miscellaneous Collections, No. 160, March, 1863.—Notes and Queries on Anthropology, published by the British Association for the Advancement of Science, London, 1874; 3d ed., 1899.—Hints to Travelers, published for the Royal Geographical Society, London, 1883 (5th ed.).—Anthropology, by E. B. Tylor.—Instruction für ethnographische Beobachtungen und Sammlungen in Central-Ostafrika, published for the Königliche Museum für Völkerkunde, Berlin, 1896.—W. H. Holmes and O. T. Mason, Instructions to Collectors of Historical and Anthropological Specimens, Part Q of Bulletin 39 of the United States National Museum, Washington, 1902.

Such a guide is here presented. Nothing has been included co
cerning measurements of the specimens or the living subjects, for th
reason that this requires much detail and personal instruction. Begi
ning with the present year (1904), such instructions can be obtaine
free at the Laboratory of Physical Anthropology in the United Stat
National Museum.

COLLECTIONS.

CRANIA AND SKELETONS.

The skull and skeletal parts of man are relatively easy to obtai
and are of great aid to anthropology.

The skull, besides many other interesting features, preserves be
the zoological as well as the racial characteristics of the individual, an
also the general form and size of by far the most important huma
organ, the brain. The other parts of the skeleton, particularly th
pelvis, scapulæ, and the long bones, besides aiding in zoological an
racial determination, render it possible to estimate the stature an
peculiarities of muscular activity in the individual and offer opportu
nities for investigating growth, decline, and numerous other physiolog
ical conditions.

Moreover, skull and skeletal remains are the only physical remnant
of man's most ancient to his most recent predecessor; hence the onl
objects from which it may be hoped to trace the biological evolutio
of man and of his varieties, and to learn the changes that have take
place in peoples still represented, or even in special families.

In addition, the osteological remains of peoples, particularly th
less civilized, preserve marks, such as artificial deformation, paintin
staining, carving, trephining, dental or other mutilation, etc., whic
throw light on a number of interesting phases in the ethnology o
these groups of humanity.

These brief remarks show the value to anthropology of ample an
comprehensive skeletal material, including that of the whites, ofte
neglected; but they also embody the conditions—to be dealt wit
below—regarding the proper methods of gathering this material.

Skeletal remains are widely distributed. This subject has to b
approached with the greatest delicacy and with profound respect fo
those reverential beliefs concerning the dead to be found among al
peoples, the savage as well as the civilized. The sources of collectio
are numerous and may be considered under three headings:

(1) Those among the whites and other civilized peoples;
(2) Those among primitive peoples; and
(3) Those of extinct peoples and early man.

I.—THE SOURCES OF SKELETAL REMAINS AMONG THE WHITES AND OTHER CIVILIZED PEOPLES.

As a large number of human bodies are annually utilized for the purposes of teaching and advancement of the medical sciences, the dissecting room becomes a rich and convenient source of more or less normal osteological material. If collection of this be supplemented with data concerning the sex, age, color, nativity, occupation, and mode of death of the individual, and the specimens be properly labeled and cared for (as is being done in at least one large American medical institution), the material becomes most suitable for many anthropological comparisons.

In recent ossuaries, or depositories of skeletons of large quantities, such as are often found in Latin countries, there is usually a mixture of too many elements in the population for the material to be of much value. But there may be ossuaries in which all the bones are of individuals belonging to one race. In that case at least the skulls are as good for anthropological study as those of the same people preserved in any other way. Opportunity to secure such material can often be gained through proper authority.

Ordinary cemeteries still in use offer little opportunity for acquiring good crania or skeletons for anthropological purposes. But, when an old grave is opened, permission might be obtained to examine an interesting skull or skeleton.

It is to be hoped that as interest in the knowledge of our own physical progress advances, old families whose remains have been carefully preserved will be willing to contribute to the study of heredity by permitting the measurement of these remains.

As physical anthropology must deal not only with man's evolution and development, but also with his decline, and with arrested or recessive as much as with normal and progressive characteristics, it must look to asylums, particularly those for the aged, and institutions such as those for idiots, insane, criminals, etc., for materials of this class. The physicians connected with such establishments, under proper advice, have it in their power to furnish specimens, photographs, and descriptions of much value to science.

Catacombs, old ossuaries, and abandoned cemeteries of known date and character contain invaluable osteological series for comparison with recent remains of the same people. There are in the United States many such burial places, which are being destroyed by progress, and the crania and other bones from such places, if collected on a sufficiently large scale, would furnish data, the lack of which is felt keenly. By the aid of such remains the development of the American population in various parts of this country could be well elucidated.

If on a battlefield the bodies are left unburied, in hot countries or seasons three or four weeks suffice to either decompose and remove, or to dry up, the soft parts to such a degree that the saving of skeleton or the whole body is quite easy. If the bodies are inter the rapidity of disintegration in the soft parts differs much accordi to the soil, moisture, depth of burial, amount of clothing, etc. the least, it takes about a year before the bones can be removed wi out much discomfort. There is, it appears from experience, no dang of infection from a body that has lain that long in the earth; but any clothing remains in the grave of a recently buried individual, d from an infectious disease, it better not be handled before a thoro disinfection.

It is to be understood that in all cases the collector should be p vided with the proper consent or legal authorization.

II.—SOURCES OF SKELETAL REMAINS AMONG MORE PRIMITIVE PEOPLES.

These sources comprise mainly burials; bodies that have been ab doned; the specially preserved skulls of relatives or enemies; and oc sionally, bodies to be found after executions, or in some hospit morgue, or dissecting room.

The modes of burial and the care taken of, or sentiments attached the dead vary greatly with different tribes, and a good local knowled of the same as well as judgment and tact are quite essential to succe ful collection.

Some care almost as a rule is attached by the relatives or the comm nity to graves comparatively recent, but there are exceptions. Old burials, particularly those of individuals not remembered and t burials of individuals not belonging to the tribe that occupies the t ritory at the time, are cared for much less or not at all, or are ev feared or hated, and thus offer good opportunities.

Bodies of those slain in battle are often abandoned by the defeat tribe and either left exposed or buried in a heap. As most or all the fallen were men in good physical condition, such material, if n mixed, is particularly valuable.

Those who died of certain diseases, more rarely the aged or helple and in some instances new-born children, are abandoned by their pe ple and may afford some opportunity to the collector.

There are still tribes on this continent, but particularly in the Phi ippines, Borneo, Formosa, Andaman Islands, New Guinea, certa parts of Africa, etc., among whom the skulls or all skeletal parts relatives, or the skulls of the enemies, are cleaned, not seldom dec rated, and at least for a time guarded. Generally such material is no easy to obtain, yet limited collections of it had been made by a numb of travelers or explorers, showing that the acquisition is not impossibl

Executions of criminals or captives belonging to primitive tribes a not rare, and the opportunities should be fully utilized for the bene of science. And the same is true of individuals of other races tha white, who die in the public institutions or are relegated to the morgue or dissecting room.

The question in all these cases is the utilization of inert and otherwise useless remains for the best interests of humanity in general.

III.—SKELETAL MATERIAL OF ANCIENT PEOPLES AND OF EARLY MAN.

Under this heading we approach a field in which are demanded from the collector freedom from preconceived opinions, the utmost care, and often considerable knowledge and experience. The further back in time we recede from the actual period, the more essential become the preservation of the specimens and of all objects associated with them, and the correct localization of all with reference to geological formations. The very existence, besides the period, of early man, in any part of the world, depends on proofs of geological character.

The osteological remains of tribes or peoples who lived within the last three or four thousand years, are met with in fair abundance, at least in certain localities. They are found in tombs, in the rooms or under the floors of ruined dwellings, in mounds, caves, rock crevices, or mines, and in more or less ordinary burials.

The bones are best preserved in dry caves, least so in exposed graves. When the latter are opened the bones are often found in such condition that it is impossible to preserve them; but occasionally with special care something of value can be saved.

Not seldom the indications of the presence of old human remains, particularly in our Southwest, are protruding slabs of stone, or numerous potsherds of better class of pottery. Mounds and caves always demand exploration, for if they have not been disturbed there is usually no surface sign to show whether or not they contain burials. Where there are signs of sedentary people, it may be expected to find at least a part of the burials somewhere near, and clustered. The existence of the custom of cremation in a certain region does not preclude the possibility of finding limited numbers of non-cremated remnants of bodies in the same region and from the same people.

All exploration for the skeletal remains of early man should be intrusted to thoroughly trained men only. The value of such remains depends entirely upon the circumstantial evidence of the find. Yet any educated man can, if an opportunity arises, do a great service to science by calling the attention of trained anthropologists or geologists to finds that seem to indicate the presence of early man.

It is impossible to indicate with any degree of probability the locations of such early remnants. The bones of paleolithic man of Europe are mainly discovered in caves. In such a case it becomes of importance to examine all the caves in the region, or at least all those dating from the same epoch. In general, all older wind, alluvial, and glacial deposits deserve attention.

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As to earliest man, and his predecessors, their skeletal remn must be patiently looked for in countries that have been most fit f the constitution and life of such beings at the time they came i existence. If it were possible to trace and explore the vicinities the lakes and rivers in the semitropical regions of the later terti and quaternary periods and find their caves undisturbed, a great d could be expected. As it is, science is reduced to the necessity awaiting and following up accidental discoveries. But in order t opportunities for making such discoveries be not lost, an intellig watch should be kept over all excavations, such as wells, cellars, r road cuts, canals, etc., in regions where, from geological and clima logical reasons, early man could possibly have existed, and especi where some finds pointing to him have already been made.

DIRECTIONS FOR COLLECTING, EXCAVATING, MARKING, PACKING, AND SHIPPING OST LOGICAL MATERIAL.

The main rules for the collector are:

Handle all skeletal material with care; secure all the identificati possible; where other parts of the body besides the skull are collecte and there are more skeletons, assure the separability of each individu if at all feasible, take every part and fragment of the skeleton found i a given place; gather everything of archeological and ethnologic value that can be conveniently moved; supplement your finds wi notes and photographs or sketches. If there is reason to belie that the remains may be those of early man, let everything discover remain *in situ* until an expert can take charge of the excavation; o if the calling or coming of an expert be impossible, have every step the work witnessed and supplemented by photographs.

The collector must exercise due care in order to preserve the vario parts of the skeleton as near as possible entire. A damaged or broke skull or bone is not useles, but, even if repair be possible, it is most less useful than it would have been if not injured.

The implements for excavation are a shovel, hoe, one or mor trowels, a small, sharp stick, and a rather stiff brush. The shar pointed pick and bar are to be avoided, unless the hardness of the sur face makes their use imperative. As soon as any part of the body i reached, it is best to finish the exposure with the trowel and brus only.

If the bones found are in a bad condition and tend to crumble, som attempt at the preservation of at least the skull may be tried; but suc attempts are seldom fully successful. At times a free exposure of th specimen hardens it remarkably. Some melted paraffin or a solutio of shellac in alcohol may be tried, if convenient; the skull is to b cleaned with the brush and the liquid then poured over it, to infiltra the bone. Glue is of little value except perhaps where the bone ten to peel off in scales. A fairly good method is the inclosing of the cleaned skull or bone within a moderate layer of plaster of Paris (after the surface of the skull shall have been covered and all interstices filled with fat or cotton or suitable rags). When a skull thus treated dries, the earth that fills the cavity may be emptied through the foramen magnum to diminish the weight; but the plaster must not be disturbed until after the specimen has reached its destination.

It is essential to identify the tribe or people of the individuals to whom the recovered bones belonged. Such identification may be obtained by the collector himself through direct knowledge, or arrived at from data and specimens furnished by him from the ethnological or archeological features of the burial. Keeping the individuals separate, where other parts of the skeletons than the crania are collected, is highly important, and very simply achieved by marking with an aniline pencil each part of every skeleton with a serial number. Such marking avoids the often inconvenient or even impracticable packing of each skeleton in a separate package.

It is an error to collect only the crania, or even only the best or adult crania, when more could have been secured. It is best to save every piece of each skeleton and leave elimination of the useless to those in charge of the material in institutions. Where skulls or bones are merely broken, it is often possible to reconstruct the specimen. The collection of ethnological objects found associated with the skeletal material serves not only for purposes of identification, but also throws light upon the age of the burial and upon the culture of the people.

Supplement all finds by notes taken on the spot, and let them be as accurate and circumstantial as possible. Note the location, character, and all learned of the burial place; its relative position with respect to ruins, if such be near; the manner of burial, the depth of graves, and the position of bodies; ethnological or archeological articles found, and where, etc. The circumstances of each find naturally determine the points of most importance.

The packing of bones and skulls in good condition is quite easy. Almost any light and elastic material may be used, such as papers, hair, rags, cut straw, leaves, twigs, sawdust, etc., and any box, barrel, basket, or crate will do for transportation or until something better can be provided. Bags should be avoided as much as possible, for bones are easily broken in them. It is well to pack the skulls apart from the rest of the bones. Place a pad between the teeth, to prevent their breaking or loss. Surround each skull with cloth or papers and pack tightly. A number of soap or other smaller boxes may be inclosed in a case, which diminishes the chances of breakage, but it is seldom possible to do this in the field. An excellent but not often practicable method is to have little boxes made especially for that purpose, each of which accommodates only one skull, and to pla these in a large, strong case. If skulls are to be sent a long dista the original boxes or crates should always be packed into large c Other bones of the skeleton need a less careful attention.

If the skulls and bones are fragile, their packing and safe tra portation is often difficult. In such instances finely cut straw, short hay, or very dry sawdust, are the most valuable packing, a each skull or small bundle of bones should be boxed separately or w separated from others. Every delicate skull should be tied in a pi of cloth which insures the keeping together of the fragments if th specimen be broken.

With each skull or skeleton should be a piece of paper containi the collector's number, the locality, and the identification of th specimen.

The shipping of osteological material from foreign countries fraught with few difficulties. Even where there are laws prohibiti the exportation of antiquities, as for instance in Mexico, human bon may be sent out. It is necessary in such instances not to include i the boxes with the bones any other specimens, and to plainly mark th contents as well as their destination on the box. In exceptional cas aid in exporting material can be obtained through the local or consul authorities.

There is no danger of transmitting contagion with bones; but som care must be exercised with the packing material.

If bones not yet fully devoid of smell are to be sent, they should b placed in very dry grass or sawdust, or into a mixture of these wit salt; and it may be necessary to put the smaller boxes containing th specimens into a large case and surround them with charcoal. Steep-ing for a brief time in a stronger solution of formalin would obviat all smell, but would also render the bones, if they still had some soft parts adhering, very difficult of preparation.

BRAINS.

There is no other organ in the human body that differs more from a similar organ in the animal than the brain. The differentiation of the brain not only separates man widely from all other animals, but tends to place in different grades individuals and smaller or larger groups within the human species itself, all of which points to the interest in and necessity for a thorough investigation of this organ.

Within the last century a large amount of research has been made on the brain of the whites. With all that, there are many parts of the organ of which no one knows the function; there are many obscure points concerning the development and decline of the brain; the gyration of the surface requires further attention; the relation of convolutions and brain weight to age, sex, weight, and size of the body, and to functional, including mental, activities, needs further elucidation; and as to the investigation of histological and chemical differences and their signification, scarcely a beginning has been made.

As to the brains of other races but little is known. For instance, the brain of a North American Indian has never been described, nor is there, so far as known, a good specimen of such a brain in existence. And this is more or less the case with regard to all other primitive tribes. Even of such peoples as the Chinese, Hindoos, and negroes the number of brains well preserved or described is very limited.

As there is no ample and generally available collection of racial brains in existence and such a collection is particularly desirable in this country, an effort is being made to establish one in the Division of Physical Anthropology of the U. S. National Museum.

There are abundant opportunities in the United States for obtaining and preserving brains of American and foreign born whites of all grades of intellectual development, and those of the American negroes, which will be of increasing interest on account of the intellectual progress and mixture of this element in the American population. There is no doubt that there could also be secured, now and then, the brain of an American Indian, although the matter is more delicate and difficult. In the Philippines and other United States dependencies the opportunity is favorable, and exceptionally good occasions for acquiring negro and probably Indian and other brains will be presented during the construction of the Panama Canal.

With such prospects there is a substantial hope that if the proper persons can be acquainted with the wants of the National Museum there will before long be a most valuable gathering of brains in the collections there.

Through the present cooperation between the Departments of Anthropology and Biology in the National Museum, the racial brain collection is being supplemented by a similar one of zoological character. A good beginning has been made; at the end of the year 1903, five months after the beginning of the collection, the total number of preserved human and other brains in the Museum reached nearly one hundred, and at the end of July, 1904, this number has a little more than doubled.

DIRECTIONS TO COLLECTORS.

Answers to the following questions should accompany each brain:

a. Name and location of tribe?
b. Sex of the individual?
c. Pure blood or mixed?
d. Real or approximate age?
e. Cause of death?
f. Length of body?

The body length is the distance from the vertex to the heels in a straight line, the feet being, if possible, flexed at right angles to the legs. Mark the points and measure on whatever the body lies upon, not on the body itself.

In warm climates the brain, if it is to be of any value for investigation, must be taken out and placed in a preservative within twenty-four hours after death; in cold climate or season, if the body was more or less exposed to cold, the brain may be in good condition even several days after death.

In taking out the brain, make a scalp cut from ear to ear over the top of the head and push and dissect the skin backward and forward until most of the skull cap is exposed. Mark your proposed cut with a knife. Cut the bone right above the supraorbital ridges and low along the sides, finishing below the occipital protuberance. Use all care not to injure the brain (it will be of value, however, even if slightly injured). To avoid cuts of the brain substance do not saw the bone wholly through, but help to detach the cap with hammer and chisel. Any saw and chisel, if properly and patiently used, will accomplish the purpose. Circular cut of the skull is easier than the angular.

When the skull cap is lifted, cover the sharp edges of the back part of the skull with cloth or cotton, to avoid injury to the brain. Cut carefully the dura mater on each side of the middle line (with scissors). Cut and remove carefully that part of the dura that lies between the halves of the cerebrum. Begin to remove the brain from the front. Cut all nerves and, finally, the spinal cord. Open the tentorium as you come to it wholly, and, helping with one hand from within, receive the brain into the palm of the other hand.

If there is any possibility of doing so, weigh the brain immediately after extraction.

Place the specimen at once in a vessel, base downward, upon a thick layer of cotton. Introduce a thin layer of cotton between the cerebellum and cerebrum. See that the specimen rests evenly. Cover with another layer of cotton, but use no pressure, and pour in an excess of ten per cent formalin. Any large tin kettle or other vessel that can be closed and made tight with wax, gum, or other substance, so that it does not leak, will do for keeping and sending the brain in. To those who apply, the Museum will gladly furnish suitable metal receptacles.

The specimen can be sent, well covered with cotton, at once; but the better way is to send it after eight days, when it is already hardened. Upon receiving the specimen, the charges for transportation will be paid by the National Museum. Address: U. S. National Museum, Washington, D. C., Department of Anthropology. Inclose a copy and soon after mail a duplicate of the required information, and give your full name, title, and address, so that proper credit can be given.

The marks of the autopsy may be obliterated by making several opposite holes in the two parts of the skull with a drill; wire or tie the parts together, and sew the scalp with a small, continuous stitch, combing the hair over all. In that manner the signs left are less than those after some scalp wounds or operations.

Whenever possible all work connected with removing the brain may be obviated by sending the entire head. In winter, a head can be sent as it is, after being covered by cotton saturated with ten per cent formalin; in hot weather it is necessary to make in addition an injection of ten per cent formalin through the carotids.

In an emergency a specimen may be sent in alcohol or strong liquor.

EMBRYOLOGICAL MATERIAL.

The great value of embryological and infant material for physical anthropology has not yet received the attention deserved. It is this material alone from which may be learned racial differences or similarities in the early phases of human development, and it is this material alone which can give instructive developmental series of brains, bones of the skull and skeleton, teeth, etc., for Museum exhibits. There are undoubtedly many physicians who would be glad to furnish to the Museum this sort of material if made acquainted with its needs. A good start has already been made in the National Museum in this direction.

SUGGESTIONS TO COLLECTORS.

Embryos, fetuses, and other products, of both sexes and all ages, are desired. The fresher the product the better; but even if decomposition is advancing the body is still of undiminished value for the skeleton. The smaller specimens of this nature can be sent directly to the Museum; but in cases of premature birth or stillbirth, or an older body, it may be necessary to secure a permission to send the specimen from the local board of health. In the District of Columbia, in the case of a premature or stillbirth, it is by law necessary to fill out the regular return of a stillbirth, to specify as the "place of burial" the National Museum, and to make the following addition on the back of the certificate:

> I hereby authorize [name of the curator] to dispose of the within-described remains as he sees proper, only in accordance, however, with the laws of the District of Columbia.
>
> ——— ———.
>
> (Signature of father or, in his absence, of mother.)

The specimen and return are then sent through the regular channel, the body, if the permission of the board of health be granted, being delivered by the agent of the Board to the Museum.

If possible, the specimens that go directly to the Museum should be sent fresh. Where this can not be done they may be sent in a well-closed vessel in any antiseptic solution convenient (carbolic acid, arsenite of soda, chloride of zinc, strong salt solution, alcohol). Formalin must not be used, for it renders the maceration of bodies for skeletons almost impossible.

In all cases where the slightest difficulty might be encountered it is best to communicate at once with the Division of Physical Anthropology, National Museum, and all needed aid or information will be given.

PHOTOGRAPHS AND CASTS.

In demonstrations and Museum exhibits, as well as in original investigations, a very important part is played by good photographs and casts. A complete collection in physical anthropology ought to include a representation in excellent photographs and facial or whole head casts of every important branch and group of humanity. As it is, there is no institution that possesses photographs or casts of the various racial divisions of even the whites alone. Nor could there be made as yet in any institution with an anthropological section an exhibit of any one nation, illustrating physical types, or such groups as that of the most beautiful individuals, the greatest athletes, the foremost literary men, artists or inventors, in that nation. More has really been done in this respect on primitive peoples than on those more civilized; but there is everywhere an opportunity for doing better.

What is required, and of which nothing can quite take the place, is a systematic gathering of both photographs and casts. Such a desideratum will undoubtedly some time be realized. In the meanwhile all contribution of good photographs or casts, from whatever part of the world they may be, will be welcome and useful.

The most valuable photographs are those of nude, partly nude, or but simply dressed individuals, from glass negatives of at least 5 by 7 inches. If larger plates are used, well arranged groups of several persons of the same sex are of particular interest.

If an opportunity to make photographs or casts is limited, choose only adults of middle age; otherwise extend at least the photography to all. Very interesting series are afforded by whole families.

If individuals are photographed, it is well to take the full face and full profile; in groups only a full face is required. The best posture is that which is most natural to that person; but the eyes should always be directed to observe some object straight in front and about their level. The photographer should know the distance at which he can obtain the best portraits with his instrument, and all individuals photographed should be placed at the same distance from his camera.

It is more valuable to send negatives with prints, than prints alone; in a laboratory almost all negatives can be more or less improved, while the possible bettering of the prints is very limited. It is also much easier to make a good lantern slide or enlargement from a negative than from a print.

In rapid or extensive traveling it may be impracticable to use glass plates and recourse must be had to films. These do not often make as valuable negatives as the glass plates, yet if the camera and the process of photography are well understood the results may be very serviceable.

With each photograph or negative of an individual should be sent data as to the tribe or nationality, place of birth, name, sex, age, and tribe or nationality of father and mother. An identification mark should be scratched in a corner on the negative itself.

Facial or head casts are made from plaster of Paris. Efficiency in making casts is best acquired under an instructor. To the proper person an opportunity to learn the procedure will be provided at the National Museum.

The process of making a facial cast, given here for those who have a chance to practice it, is as follows:

Have the subject comfortably seated on a chair with a back and head rest. See that the face preserves throughout its most natural expression, the eyes being open, and warn the subject against moving, swallowing, coughing, sneezing, or spitting. The lips should not be held tight or puckered, or the mouth distorted. Fasten a wide, ample piece of muslin, like an apron, below the neck of the subject. Brush the hair backward, without pulling the skin, and fasten it by a moderately tightly applied muslin band about 2½ inches broad, leaving all around the forehead and temples a little of the hair exposed.

Work into this visible portion of the hair, and also into the eyebrows, mustache, and beard enough soap paste to prevent inclusion into the plaster. Use either the commercial green soap that comes in paste, or boil ordinary soap with water until the liquid thickens. Introduce a little cotton into each ear. Oil, by means of a camel's-hair brush, the whole face and neck with light paraffin oil (or any other oil that is not viscid); also oil the hair band. Care must be exercised that no excess of the oil is left anywhere and that nothing enters the eye. This finishes the preparation. No nasal tubes are required.

The next step consists in mixing the plaster. Only the best dental plaster should be used. Fill a small basin, of any kind, with lukewarm, or at least not too cold, water, add a pinch of common salt and some wash blue or other coloring matter. Sift the plaster onto the top of the water from your hand, without mixing, until the moment when it stops sinking—this exact stage must be learned from practice. Mix then, without churning, with a common spoon, gather the surface bubbles and any possible dirt and throw away, and the liquid, of cream consistency, is ready for use.

The first layers of the plaster are applied to the forehead, about the the eyes, and over the upper part of the face, with the help of a spatula or a little spoon. The excess of the plaster flows down over the face and onto the apron.

The success of the cast depends largely on the dexterity of the manipulator in this part of the procedure.

The upper part of the face being covered, advance rapidly to the ears and lower part of the face. At this stage it is of advantage to throw the plaster on, with short, gentle jerks, with the fingers. Fill one ear only, but carry the plaster around far enough to show the location of the other ear. If the plaster begins to thicken, strengthen what is already on, but without employing any pressure, and make or have made rapidly a new supply, slightly thicker than at first. Then by repeated throws, as well as with the help of the spatula or spoon, but avoiding pressure, cover the whole face. While the cast is drying add very gently more about the eyelids, taking again much care to use no pressure and especially not to get any of the plaster into the subject's eye, where it would produce severe burning. Add also, if necessary, more plaster about the nostrils. On the ear that is covered, carry the plaster just a little over the convex border.

Strengthen the cast over the forehead and median line of the face; the thickness should range from about one-fourth to three-eighths of an inch.

When through with the application of the plaster, post yourself behind the subject and gently support his head until the cast is sufficiently hard. During the hardening the plaster will generate warmth, but this never becomes too inconvenient or dangerous.

The proper hardness of the cast is learned through experience; it can be ascertained by tapping on it with a finger or some object.

The removal may begin before the hardening is complete, at the hair ribbon, which is drawn backward. Then proceed all along the edge of the cast and press the skin back from it. With the help of the fingers and perhaps of the spatula, free the helix of the ear and by this draw the ear backward. All this can be begun quite early, to occupy the subject's attention and satisfy him, and carried on so slowly that the plaster has ample time to harden. To take the cast off, lay the left hand on its top, grasp with the right its chin part, and manipulate slowly and carefully up and down, and push downward and forward, until it slips off.

There is occasionally some difficulty on account of the beard, or the subject may have tried to swallow or cough or have moved, and a part of the cast may be cracked or imperfect, or a portion may be broken off in removing it. All that can be advised in such contingencies is patient manipulation or careful repair by fitting of the separated parts and additions of plaster to the outside of the cast.

The orbits and nostrils in the finished cast are filled with plaster and the whole is allowed to dry, after which, if the cast is to shipped, it must be prepared for the positive. This is done by simply soaking the cast in a strong solution of common soda (sodium carbonate); or by the soaking and subsequent careful application of thin oil to the inner surface. These processes, with the staining of the negative cast, facilitate its subsequent chipping off from the positive.

The last step consists in carefully mixing a larger quantity of plaster, with addition of salt but not of coloring matter. Pour some of this into the negative, and by inclining the latter in all directions allow the plaster to form a good, thin covering of the whole inner surface. Then gradually add more plaster, persisting in the slow movements, and finally help with the spatula or spoon. It is desirable to make the positive at least half an inch thick. Mark then on the concave surface of the positive with some sharp point whatever data are essential to go with the casts, and allow the whole to dry thoroughly before packing.

In the manner just described, with a little preliminary practice and continual care, from eight to ten first-class facial casts can be made in a day. Different operators may use methods that vary more or less from the above, and there is no harm in adopting any modification that tends to facilitate the procedure or improve the result. Some operators try to secure a cast of the whole head, but this has no advantage. With a good facial cast and photographs the head can be modeled almost to perfection.

Casts of the body should never be undertaken except by one well practiced in the art, for the operation is not without danger to the subject.

Casts of the lowest part of the trunk and of the limbs can be made without any very great danger or difficulties, but they also need experienced hands.

The skin must in all instances be well oiled and the part must not be deformed by wrong position or pressure. A provision for the removal of the cast in sections must also be made, which is usually done by including in the first layer of plaster, along the line of intended separation, a linen thread, and by cutting the cast with this as it begins to harden. The preparation of the plaster and other details are practically the same as in facial casting.

In packing casts, pad well and tightly with very dry hay or other suitable substance, and use only small boxes or barrels.

ADDITIONAL OBJECTS FOR COLLECTION.

It is true that the variations of every organ in the human body are of anthropological importance; but to extend Museum collections to all these parts is at present hardly practicable. The skeletal, brain, and fetal materials claim the first attention. After these have been more thoroughly elaborated and exhibited, there is a good hope that later workers and additional means will make all needed extensions of physical anthropology possible.

The above does not imply that good opportunities to obtain especially valuable specimens for physical anthropology other than skeletal, brain, or fetal should be neglected. Some of the most interesting variations exist in the skin and its appendages, particularly the hair and teeth, and a good collection of any of these parts from any tribe or people is very desirable. Many revertive and other anomalies, some of which may eventually be found to be more or less racial in character, exist in the muscular system, the intestines, the liver, the circulatory apparatus, etc. But for the soft specimens of this category, the most suitable place at present is some representative museum of general anatomy.

The collecting of specimens of skin, hair, and teeth calls for but little instruction. Examples of skin can be obtained, best in small squares, from the dead. The squares should be alike in size and from the same region of the body. The unexposed parts of the back, chest, or limbs are suitable. The specimen should be stretched, with the help of pins, on a piece of board and dried.

Hair should be obtained from persons in good health, preferably children, and again from adults not differing much in age. The aim of the collector should be to obtain all the variations of hair in a particular people.

With both skin and hair it is necessary to have the supplementary data of race, purity of blood, sex, and age.

The opportunity to obtain teeth is limited to the dentists. Here, also, should be recorded with each specimen the race, sex, and age, besides its exact position.

THE COLLECTORS.

The nature of the material required by physical anthropology for the purposes of investigation and exhibition is such as most interests the physician, and therefore this appeal is addressed mainly to medical men, particularly to those who travel, or have charge of hospitals, colleges, dissecting rooms, and remedial institutions. As physical anthropology and anatomy are intimately related and largely interdependent, any service done to the former is also done to the latter, and is an aid to the advance of the medical as well as the natural sciences.

Yet there are other men, to whom science has often been indebted, whose good will, when opportunities arise, might result in much benefit to physical anthropology. Among these are foreign missionaries and teachers, particularly among other peoples than the whites; explorers, primarily interested in other sciences; miners, prospectors, and surveyors and engineers of railroads; men engaged in trades that take them into virgin regions; and travelers of means and leisure. But it lies in the power of every intelligent person to call attention to the discovery of an ancient burial place or cemetery, or to prevent destruction of specimens and direct them to where they can be made useful.

It is almost superfluous to repeat the well-known fact that all the collections of the U. S. National Museum are entirely for public instruction and freely accessible to all scientific workers.

The National Museum is always ready to respond to telegraphic or other requests for vessels or preservatives; and in return for their good will the Division of Anthropology is at all times ready to scientifically aid those who favor it with needed material.

OBSERVATIONS.

An observer trained in anatomy and physiology, or especially instructed, can collect many data of value to physical anthropology. As has been mentioned before, this science comprises the study not only of variations in well-defined groups of mankind, but also of their causes, and this opens a large field for inquiry. But the subject is so important that the utmost care must in every case be exercised, even by well-trained men, to avoid errors.

The desirable observations are those concerning the topography, geology, climatology, and quality of water supply, of the particular region whose people are studied; the nature and sufficiency of food; use, present and past, and abuse of alcoholic beverages or substances like coca, hashish, or arsenic; occupations; the dwellings and habits of life; prevalent diseases; sexual customs or habits, including the age at which sexual relations are established; polygamy, polyandry, and close intermarrying; occurrences of impotence or sterility, and perversion.

Among the most interesting points to ascertain is the proportion of sexes in the tribe.

Taking the woman over 50, one can ascertain, though much care is necessary, her age at the time of the first conception; the number of progeny living and the number that died; the number of abortions with causes; occurrence of twins or triplets; occurrence of blind, deaf, anomalous, or monstrous children.

With infants it is desirable to learn the periods of the beginning and their full ability in walking; the length of exclusive nursing and of nursing in addition to other food; the manner of feeding exclusive of nursing; the time of teething; and infant diseases with mortality.

Among people who keep account of their age, interesting facts may be obtained in regard to puberty, menopause, appearance of gray hair, and data as to longevity.

The occurrence and character of albinos should be noted in detail, giving the family history. The occurrence or prevalence of goiter, cretinism, idiocy, and insanity, as well as tuberculosis, is of anthropological as well as of pathological importance. The description of artificial deformations, mutilations, or operations, may aid in the elucidation of certain conditions found among the skeletons or brains from the region.

Description of hair and beard is desirable. Note the ordinary and the maximum length to which the hair or beard grows when not trimmed; the quantity and distribution of the beard; the character of both hair and beard, whether gross or fine, and whether straight, wavy, curly, or in tufts. The color of the hair and beard often differs. In noting the color it can be referred to the standards, but it is more convenient to use the terms light brown, dark brown, black, pale yellow, red and chestnut (red-black). When necessary these simple and generally well-understood terms may be supplemented by further description and when possible, with specimens.

If there be an opportunity, notes on the hair of the axillæ and pubis may be added, but these points are not of much importance.

The color of the eyes, or more properly iris, is of interest. This also should be recorded in simple terms. The usual colors are gray, greenish, pale blue, rich blue, light brown, and dark brown. The darkest shades of brown are usually classed as black. In anomalous cases the iris may show spots of other colors. The conjunctiva may be pearly white, bluish, or yellowish.

The color of the skin is an item of importance and one seldom properly reported. In this particular it is first of all necessary to choose for comparison the same parts of the skin, and among those who wear clothes, preferably those parts that are usually covered. The upper part of the arm or the back is especially suitable for this purpose. In this case the color should invariably be compared with and recorded by some well-known standard, and the observation should extend to both sexes and numerous individuals. It was largely a lack of precision in reporting the color of the skin that made a red man of our brown Indian, and there are other similar examples. One of the best-known arrangements of standard colors is that of Broca, a part of which, for easier comparison, is appended to these instructions.

Of measurements, only that of the height is fairly safe to be taken by an untrained observer. This measurement is secured by placing a subject against a vertical plane, without shoes or sandals, with the feet together, standing erect, and looking straight forward.

It is well to have fastened on the plane a graduated board or a tape, but the height can also be obtained by marking a point a meter or yard from the ground and measuring with a tape from this to the mark corresponding to the top of the head of the individual. The height is determined by the aid of a square or a piece of board held at right angles against the vertical plane and lowered until it encounters the resistance of the head when a mark is made. A square corner cut from any box will serve this purpose.

At least twenty, not deformed, fully adult individuals of each sex should be thus measured; but the larger the number of individuals the more correct will be the mean height, and the more valuable the general result obtained from the measurement.

Besides the above, it is possible, with appropriate aids or instruments and care, to test the special senses; the pressure or traction force (with dynamometer, Mathieu or Collin); to make, on healthy individuals (for this examine the tongue) valuable observations on pulse, respiration, and temperature; to test for swiftness or endurance in running; to observe the capacity for carrying burdens, enduring hunger and thirst, and capacity for excess in food.

Many of these data are purely physiological; the physiology of races, tribes, or other groups of mankind, however, goes hand in hand with physical anthropology and is equally important.

BROCA'S COLOR STANDARDS.

These color standards were originally published in Pierre-Paul Broca's Instructions générales pour les recherches anthropologiques à faire sur le vivant; 2 ed., Paris, 1879; and are printed after a copy of the original. They are retained in order that new observations may be compared with those made in the past. To facilitate determination, Broca's arrangement of the colors on the pages has been somewhat changed, but his numbers remain. To use the color scheme, choose a certain ordinarily unexposed part of the skin, as of the arm or the back, and match one color after another of the plates with the skin until the one is found which agrees most closely, and this you record by its number.

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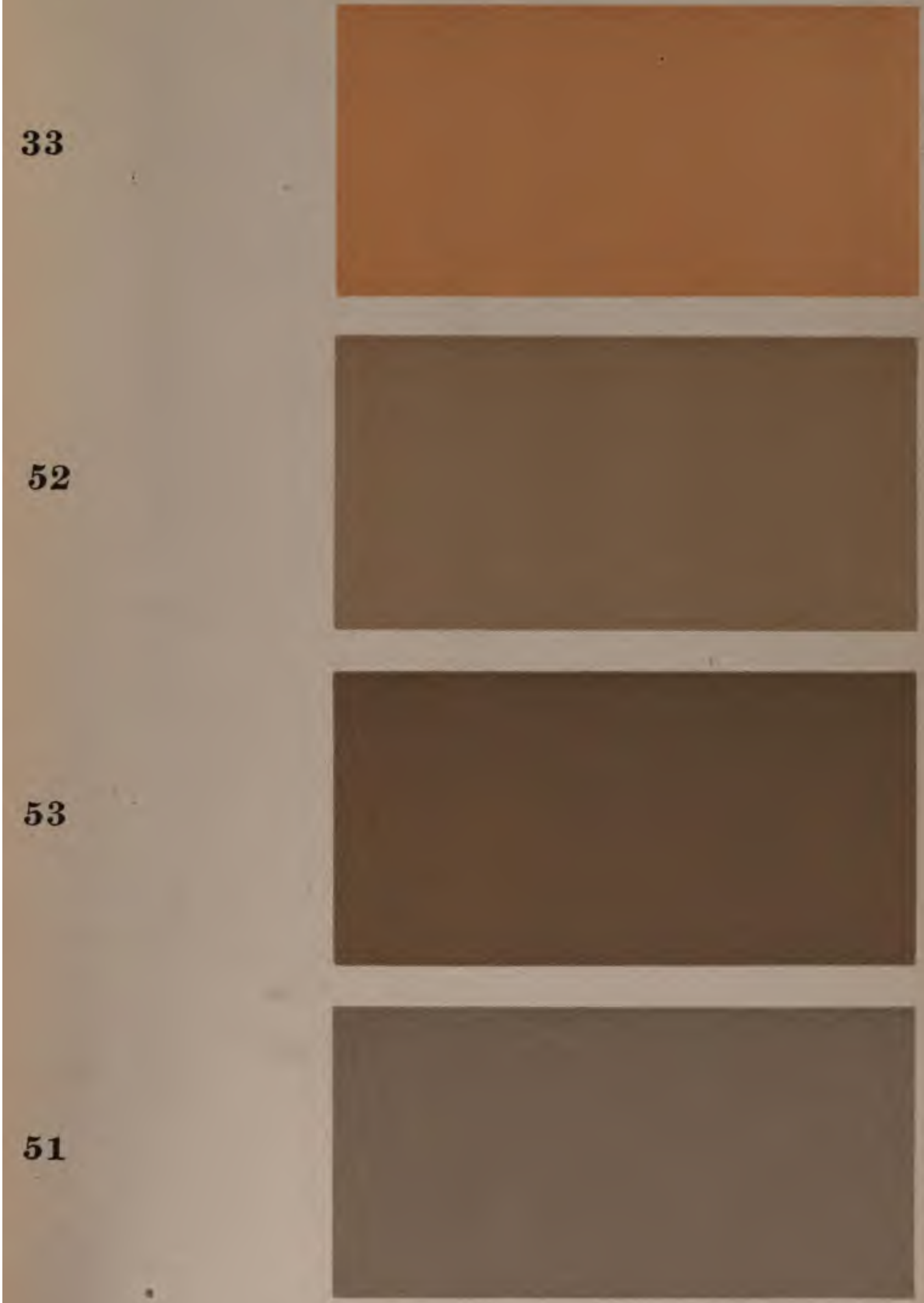

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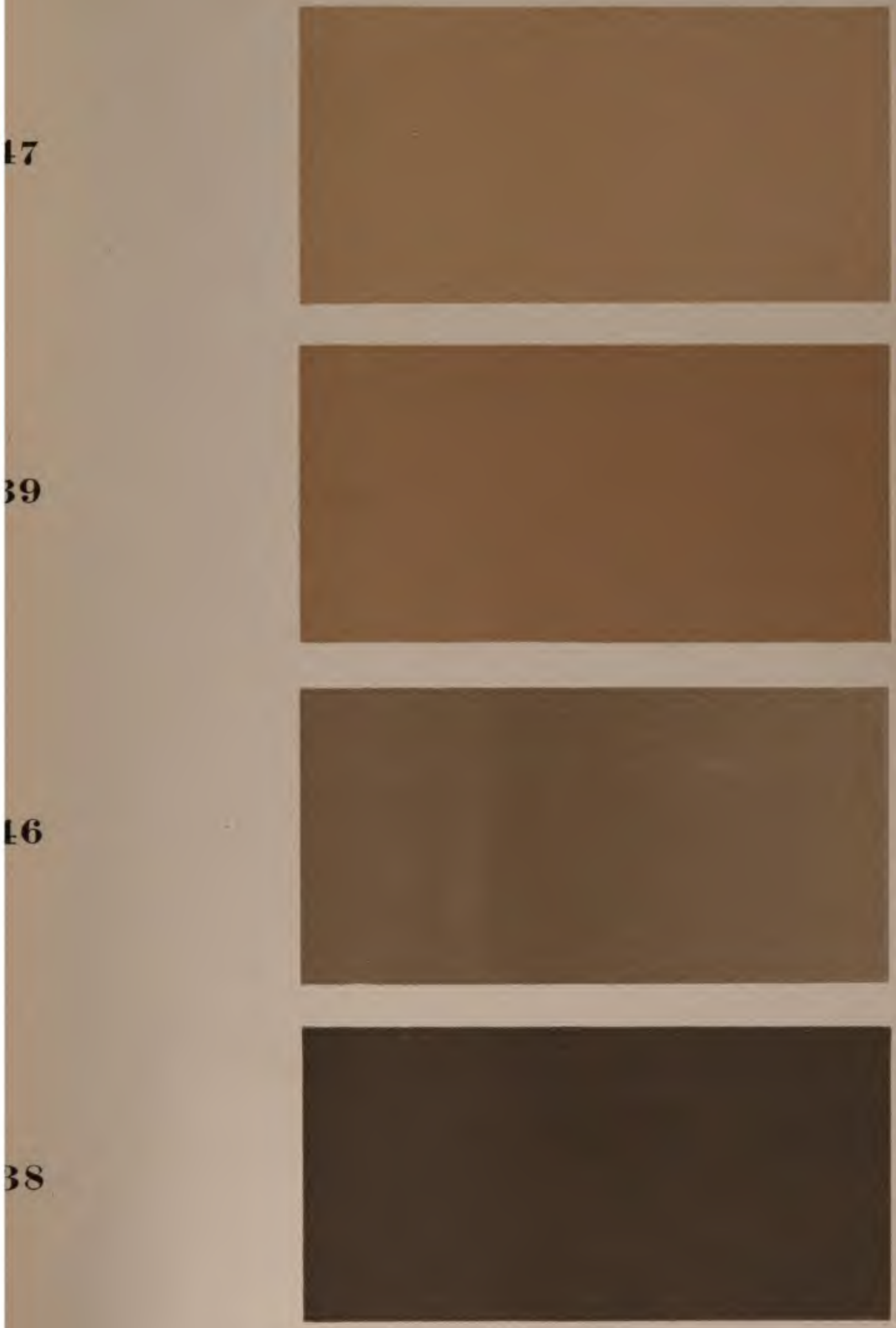

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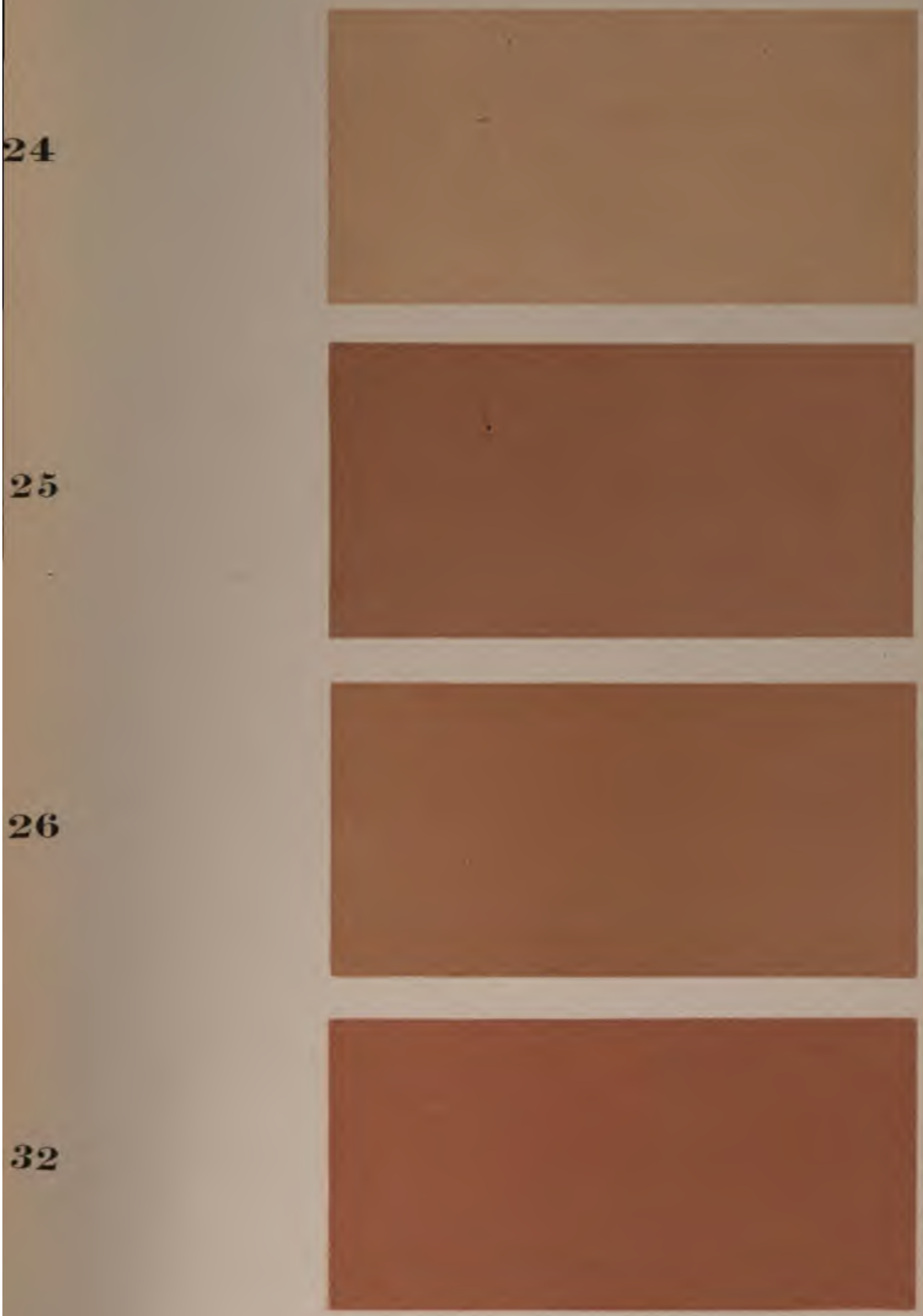

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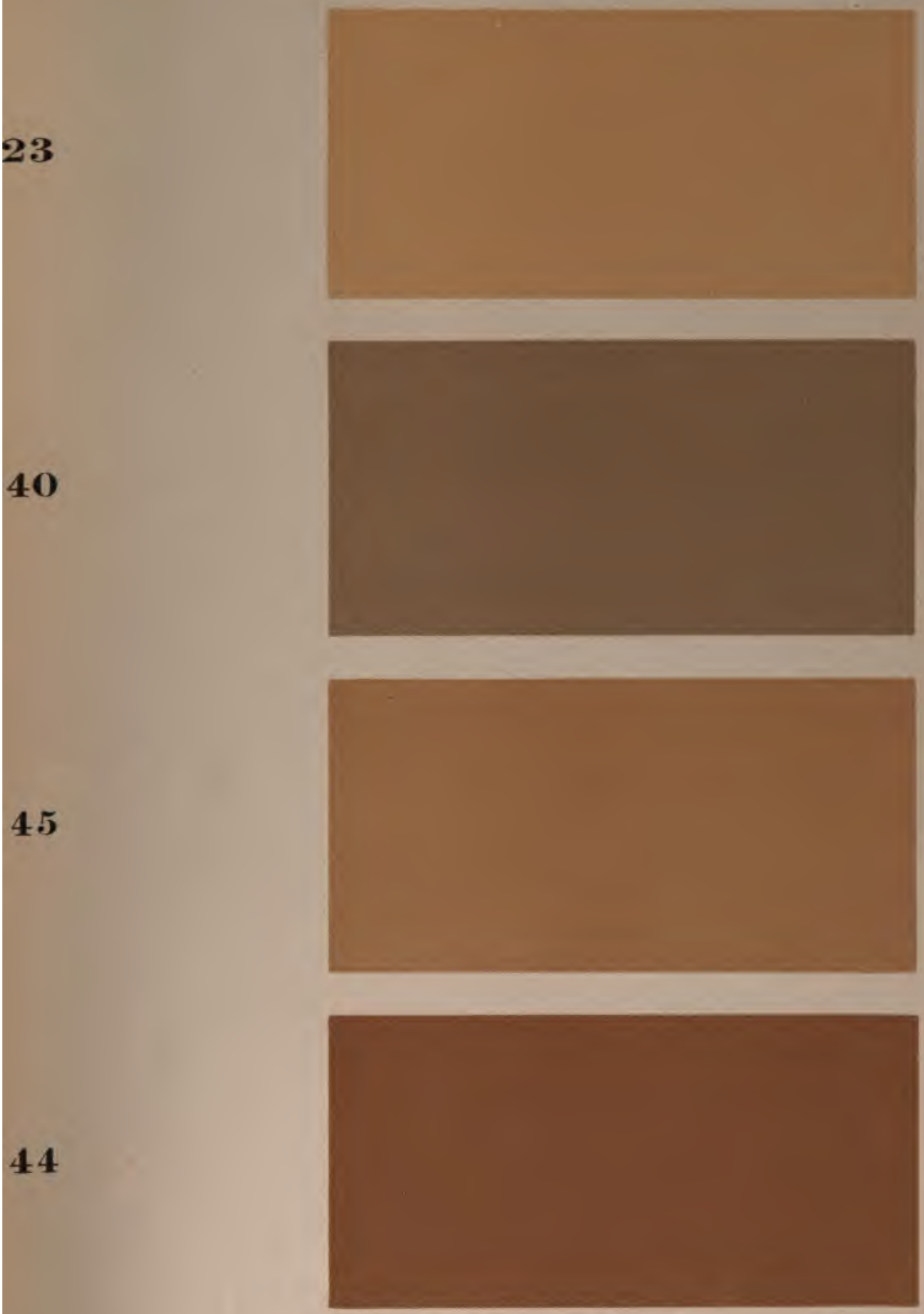

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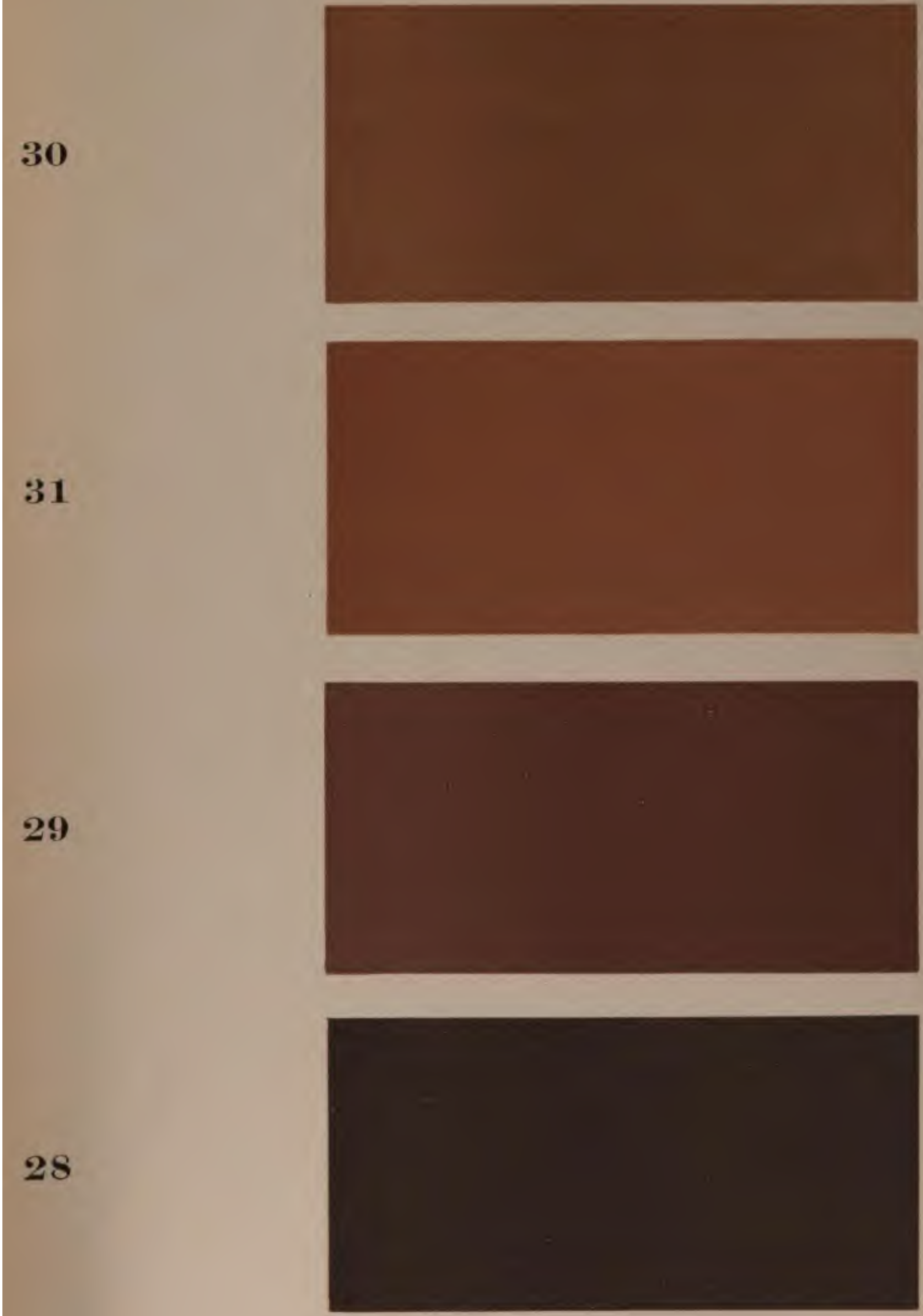

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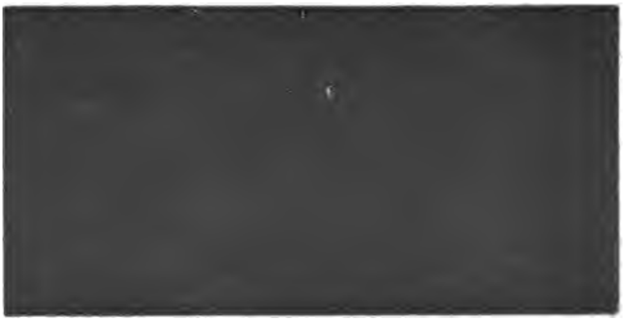

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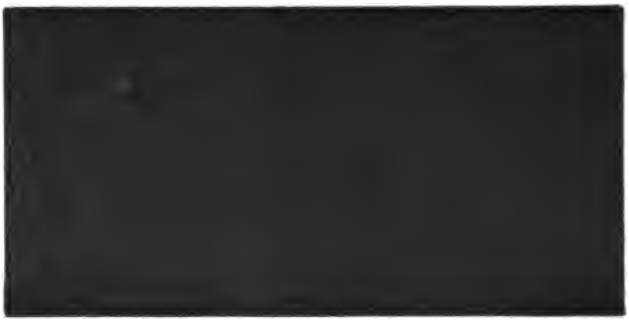

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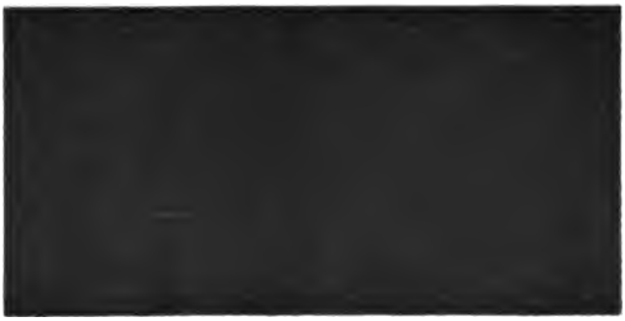

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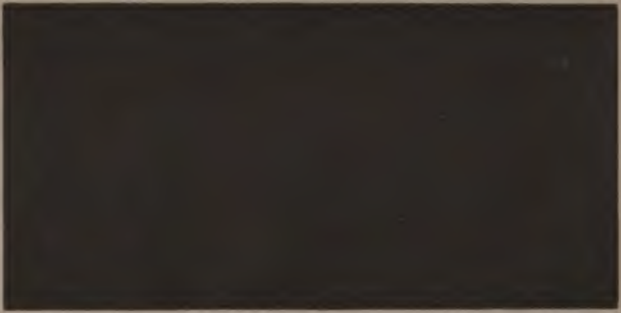

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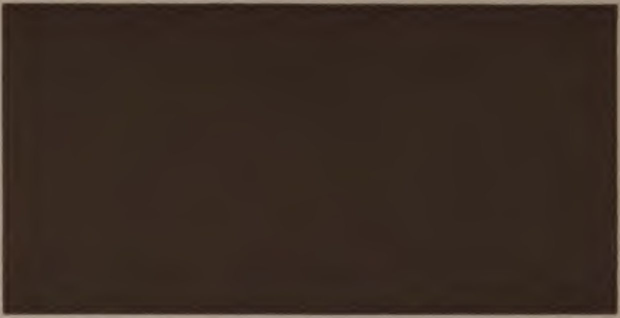

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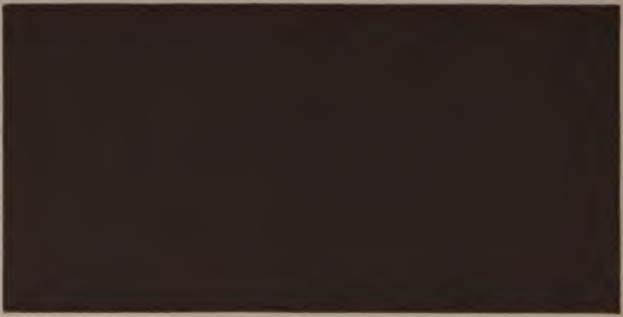

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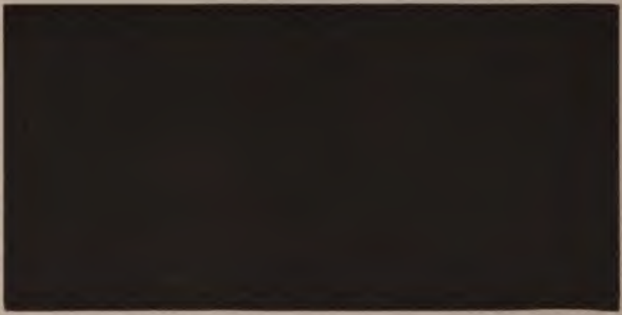

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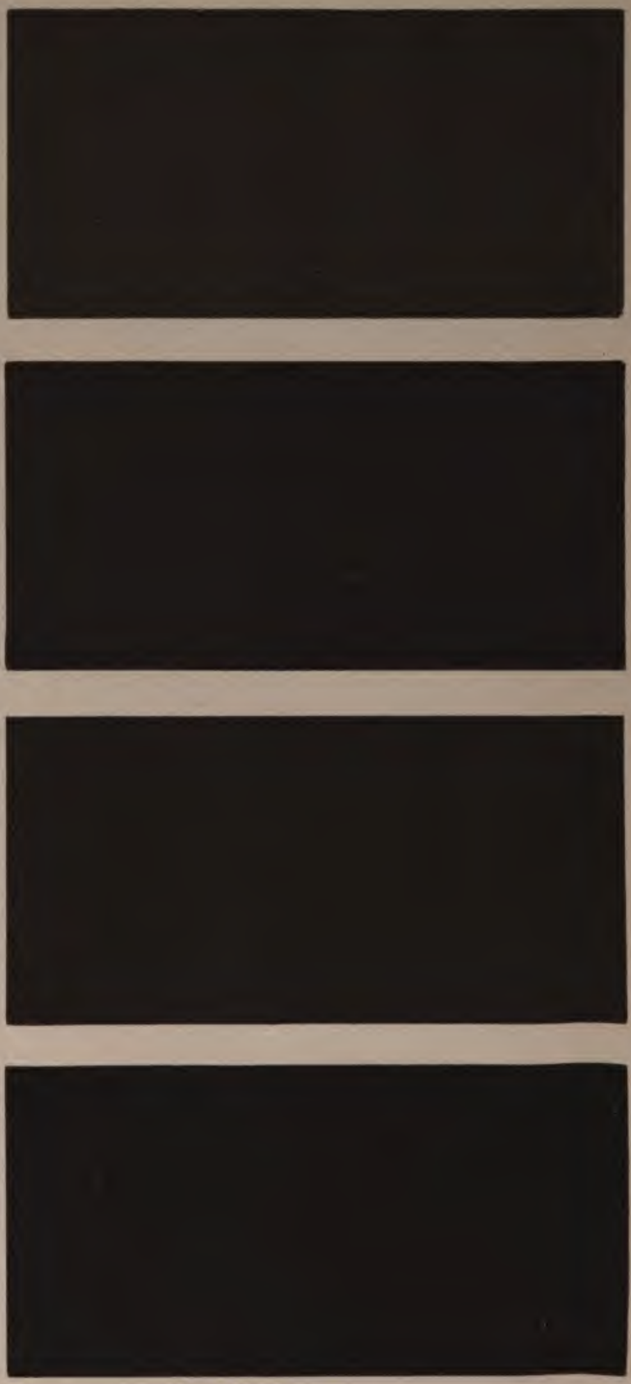

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